Report as of FY2006 for 2006NE126B: "Water quantity and quality within the Great Plains: Model development within a Nebraska Basin"

Publications

Project 2006NE126B has resulted in no reported publications as of FY2006.

Report Follows

Water Quantity and Quality within the Great Plains: Model Development within a Nebraska Basin

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Water is the lifeblood of the Great Plains. However, both water quantity and quality within the Great Plains is expected to alter in response to climate change. During the 20th century, temperatures in the Northeastern and Central Great Plains have risen more than 2°F on average, and up to 3°F in various regions [e.g., Groisman et al., 2004]. Such a trend is expected to continue in the coming years, as predicted by the Global Climate Models [Easterling et al., 2000]. Some of the most profound impacts of global warming in the Great Plains can be summarized as: (1) longer growing seasons due to early onset of spring temperatures; (2) increase in climate extremes- including air temperatures, rainfall rates, and floods; (3) alteration in the timing of growing season precipitation- less frequent storms with increased magnitudes; (4) reduction in soil moisture, as the rate of increase in potential evaporation, with rising temperatures, is expected to surpass precipitation.

During the last year, we have engaged in 4 activities to increase our understanding of how climate will alter water and material fate and transport through Nebraksa watersheds. The first activity involved a characterization of the Elkhorn Watershed using spatial topographic analysis. The analysis is the first step in building our understanding of hydrologic flowpaths across the landscape. This component of the work is ongoing.

The next activity involved conducting an in-stream tracer experiment to characterize hydrologic exchange through Maple Creek, a 3rd order stream within the basin. Prior to the experiment, 48-hours of sampling occurred within the stream over an entire flood pulse. Following the flood pulse, measurements were made at 4 stations within the stream both during the tracer injection and following for 24-hours. Analysis of these samples is almost complete, and includes dissolved organic carbon characterization, anions, and dissolved nitrogen species. Analysis of these results in conjunction with stream respiration measurements is now underway, and we expect the analysis to result in a peer-review publication.

The 3rd activity involves basin wide characterization of organic matter dynamics through time. We developed an approach to measure bioavailability of organic matter and organic matter characterization within the aquatic system. Five stream sampling stations ranging from 2nd – 7th order streams are now being measured on a monthly basis to both build on our understanding of in-stream cycling, with both an expectation of a peer-reviewed paper and submission of proposal for continuation of the work.

The last activity involved the PI Scott in learning a modeling code SPARROW (Spatial regression on watershed attributes), a U.S.G.S. code. Scott attended a 4-day training workshop at the E.P.A.. Although the model has not yet been applied by the PI within the Great Plains, we expect that this spatial regression model will be used within our group to compliment other hydrologic modeling to quantify relationships between sources, landscape delivery, and in-stream retention of

nutrients / contaminants.